

Three New South American Species of *Salacia* with Fasciculate Inflorescences (Celastraceae, Hippocrateoideae)

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ABSTRACT. Three new fasciculate flowered species of *Salacia* L. (Celastraceae, Hippocrateoideae) from the Amazon basin are described: *S. acevedoi* Lombardi is distinguished by its small flowers, stamens with short filaments, disc connate to ovary, and size of fruits; *S. negrensis* Lombardi differs by its habit, characteristics and shape of leaves, flower diameter, features and size of stamens, and number of ovules; and *S. odorata* Lombardi is characterized by its long pedicels, conical flower buds, strongly adherent petals, and flat disc with fimbriate outer border.

RESUMO. São descritas para a bacia amazônica três novas espécies de *Salacia* L. (Celastraceae, Hippocrateoideae) com inflorescências fasciculadas, *S. acevedoi* Lombardi a qual se distingue pelos estames pequenos com filetes curtos, disco conado ao ovário e pelo tamanho dos frutos; *S. negrensis* Lombardi difere pelo hábito, características e forma das folhas, diâmetro da flor, características e tamanho dos estames, e número de óvulos; e *S. odorata* Lombardi é caracterizada pelos pedicelos longos, botões florais cônicos, pétalas fortemente aderentes e disco achatado com margem externa fimbriada.

Key words: Brazil, Celastraceae, Ecuador, Hippocrateoideae, IUCN Red List, Peru, *Salacia*.

The former family Hippocrateaceae is now included in Celastraceae as a subfamily that comprises five tribes, 24 genera, and ca. 357 described species (Hallé, 1990; Mennega, 1997) distributed worldwide in tropical and subtropical areas.

Delimitation of the Hippocrateoideae genera is controversial. The number of genera range from two, *Salacia* L. and *Hippocratea* L. (Peyritsch, 1878), to 17, according to Miers (1872). In this work I follow Smith (1940), who recognizes three genera segregated from *Salacia*, *Cheilochlinium* Miers, *Peritassa* Miers, and *Tontelea* Aublet and included in the tribe Salacieae with the African *Salacighia* Loesener and *Thyrso-salacia* Loesener (Mennega, 1997).

Salacia is a genus with ca. 200 species (Mennega, 1997), distributed worldwide in the tropics and subtropics. Smith (1940) recognized 29 species from

the Neotropics, of these 14 with fasciculate inflorescences. Since then, Mennega described four others (Mennega, 1984, 1991), three of which have fasciculate inflorescences. The last comprehensive taxonomic study of the genus, although unpublished, is by Hedin (1999), who recognized 38 species in the Neotropics, 20 of these with fasciculate inflorescences, including two new taxa from Ecuador and Peru.

The probable paraphyly of *Salacia* s. str. was pointed out by recent molecular studies (Hedin, 1999; Simmons et al., 2001a, b). Worldwide analyses of representative species from both the Old and the New Worlds are still needed before any generic realignment can be proposed.

While working on a taxonomic study of South American species of Hippocrateoideae as part of a study on the Neotropical species, I discovered three new species from the Amazon basin. These newly described species apparently occur only in small areas within forest extensions, but such distribution may be a sampling artifact.

1. *Salacia acevedoi* Lombardi, sp. nov. TYPE: Peru. Cuzco: Prov. Cuzco, Distr. Camisea, Campamento San Martín-C, Camisea Production Unit W of camp, 11°47'S, 72°41'W, 26 Jan. 1997, P. Acevedo Rodríguez 9084, D. Bell, K. Rankin & S. F. Smith (holotype, US [2]). Figure 1.

Haec species *Salaciae grandifoliae* (Martius ex Schultes) G. Don et *S. juruanae* Loesener foliis magnis et inflorescentiis fasciculatis affinis, sed floribus et staminibus minoribus, cavitatibus in margine interno disci nectariferi ubi stamina inserta et fructibus minoribus differt. A *S. grandifolia* distributione geographica distincta distat.

Slender or scandent shrub, 2–4 m, glabrous, branches terete to compressed, smooth, sparse lenticellate, drying green. Leaves opposite to subopposite; stipules not seen, caducous, leaving interpetiolar ring; petioles 1.2–2.5(–3.4) cm, canaliculate, drying wrinkled and green; blades (26.1–)33–40.5(–50) × (9.8–)15.2–17.2(–24.5) cm, elliptic, the base cuneate to rarely rounded, the apex acute, the margin

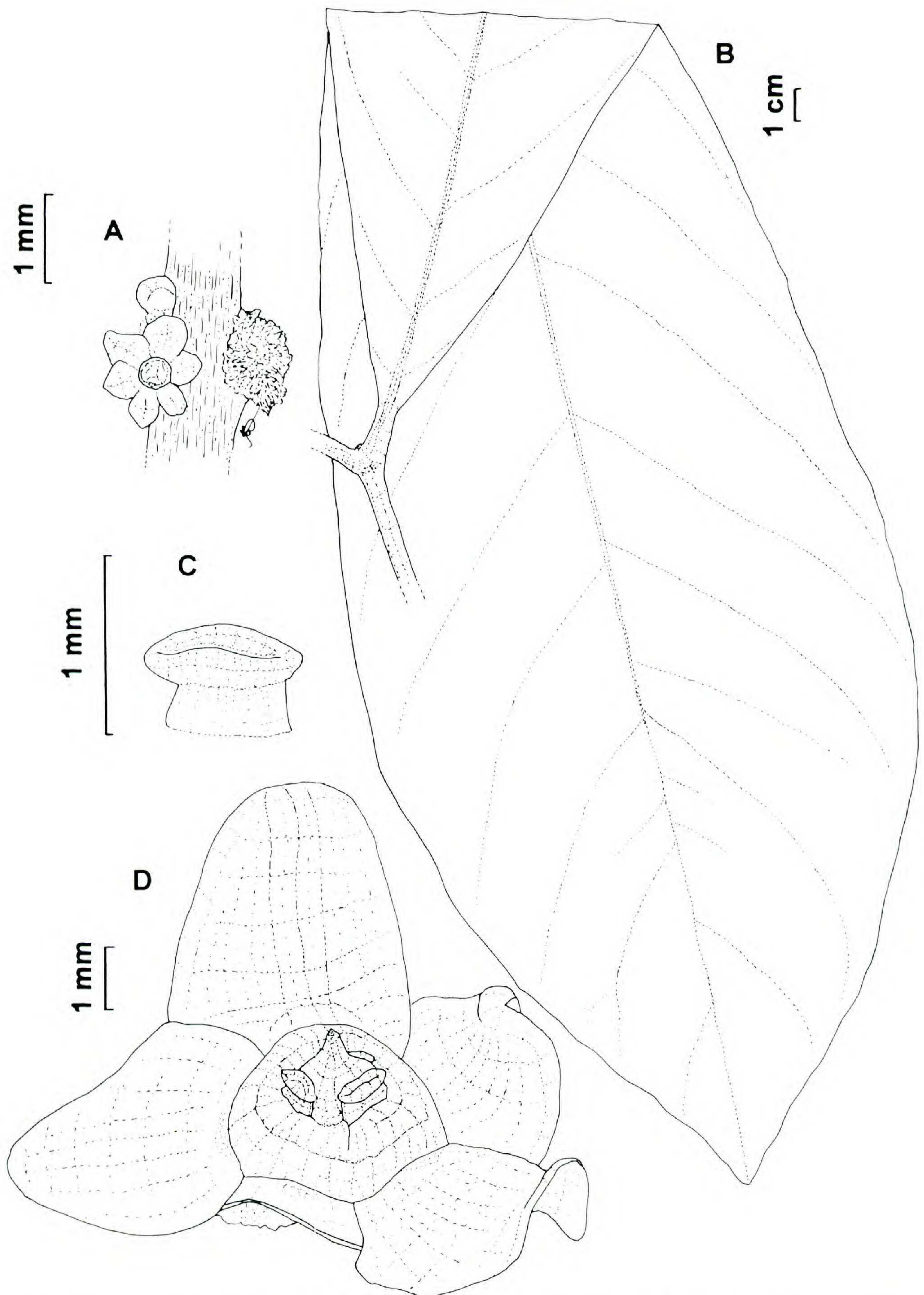


Figure 1. *Salacia aceredoi* Lombardi. —A. Detail of the fasciculate inflorescence. —B. Branch with leaf. —C. Abaxial view of stamen. —D. Apical view of flower. Drawings by the author: A, C–D from the holotype *P. Acevedo Rodríguez 9084 et al.* (US); B from *Wallnöfer 11-161188* (W).

entire and thickened, chartaceous, drying gray-green, venation brochidodromous with veins prominulous on both sides, secondary veins immersed, tertiary ones invisible. Inflorescence fasciculate, with indeterminate

number of flowers, ramiflorous at leafless nodes, apparently flowering during successive seasons; bracts 0.7–0.8 mm, triangular, the margin minutely fimbriate; pedicels 2–2.4 mm, terete. Flower buds spherical.

open flowers yellowish green, 6.1–7.6 mm wide at anthesis; sepals 5, 1.3–1.8 × (0.8–)1.7–3.2 mm, triangular, unequal, carnose, yellowish green, the margin minutely erose; petals 5, 3.3–3.8 × 3.2–3.6 mm, widely elliptic, ± papery, spreading at anthesis, yellowish green and rusty brown at base on the adaxial side, the margin entire; disc annular-pulvinate, 0.6–0.9 mm wide, 0.7–1.1 mm thick, carnose, connate with ovary lobes, the outer margin not flattened, rounded at edge; stamens 3, 0.7–0.8 mm, anther only emerging on the stamen-pockets formed by the fusion of disc and ovary, the filaments flattened, wide but very short, the anthers 0.29–0.39 × 0.84–0.9 mm, transverse ellipsoidal, basifixed, bilocular, confluent thecae, dehiscence extrorse by apical slit at ca. 160°; pistil pyramid-shaped, ovary 3-lobed, 3-locular, with 2 ovules in each locule, style ca. 0.52 mm after anthesis, central, triangular, stigmas obscure. Mature drupes 2.3–2.7 × 2–2.6 cm, spheroid or ovoid, the epicarp crustaceous, smooth or slightly tuberculate, drying dark brown, immature with 3 clear strips; seeds 1.4–1.5 × 0.7–0.8 cm, ellipsoid.

Phenology. Collected with buds and flowers in November and January, collected with immature fruits in September, October, December, and January, and with mature fruits in January.

Distribution and habitat. *Salacia acevedoi* is apparently restricted to Peru, where it occurs at altitudes of ca. 260 or 400–500 m and was reported in moist and dry lowland forests.

Conservation status. This species occurs inside an official conservation unity (Bosque Nacional de Iparia) and is thus protected, but the population status inside and outside the conservation area is unknown and *Salacia acevedoi* is classified as Data Deficient (DD) by the IUCN Conservation Status categories.

Vernacular. Auca-Murcuhuasca (in Schunke Vigo 4642).

Etymology. The specific epithet of this species is homage to the type collector, Dr. Pedro Acevedo Rodríguez.

Salacia acevedoi resembles *S. grandifolia* and *S. juruana* (including *S. gigantea* Loesener), through its big leaves and shrubby habit, but *S. grandifolia* is restricted to the Brazilian Atlantic rainforest and has larger flowers (14.5–16.3 mm wide vs. 6.1–7.6 mm), stamen-pockets on its disc are not apparent, longer stamens (1.9–2.4 mm vs. 0.7–0.8 mm), totally yellow-green flowers (vs. petals with base rusty brown on the adaxial side), and bigger fruits (5.5 × 5.4 cm vs. 2.3–2.7 × 2–2.6 cm). *Salacia juruana* also differs

from it through color of dried leaves (brown-olive or gray-green above and brown below vs. gray-green), bigger flowers (10.5–24.1 mm wide vs. 6.1–7.6 mm), stamen-pockets on disc not apparent, longer stamens (1.39–3.43 mm vs. 0.7–0.8 mm), and generally larger fruits ((2.3–)3.3–5.1 × (2.6–)3.2–3.5 cm vs. 2.5–2.7 × 2 × 2.7 cm).

Paratypes. PERU. **Huánuco:** Prov. Pachitea, Distr. Puerto Inca, Bosque Nacional de Iparia, a lo largo del Río Pachitea, ca. del pueblo de Puerto Inca, 9 Dec. 1968, *Schunke Vigo 2844* (F, US); Prov. Pachitea, region of Pucallpa, W part of the “Sira mountains” adjacent lowland, ca. 26 km S of Puerto Inca, biol. field stat. “Panguana,” 16 Nov. 1988, *Wallnöfer 11-161188* (W), 19 Oct. 1988, *Wallnöfer 11-191088* (W), 17 Nov. 1988, *Wallnöfer 13-171188* (W). **Loreto:** SE of Pucallpa, next to jct. of Río Pachitea Río Yuyapichis, village of Panguana surroundings, ca. 260 m, 26 Sep. 1985, *Morawetz & Wallnöfer 118-26985* (W-2). **San Martín:** Prov. Mariscal Caceres, Dept. Tocache Nuevo, Puerto Pizana (margen derecha del Río Huallaga), 12 Jan. 1971, *Schunke Vigo 4642* (F, P, US).

2. *Salacia negrensis* Lombardi, sp. nov. TYPE: Brazil. Amazonas: Rio Negro, Ilha da Nova Vida, 26 Nov. 1947, *R. L. Fróes 22909* (holotype, IAN; isotype, SPF). Figure 2.

Haec species *Salaciae ellipticae* (Martius ex Schultes) G. Don structura inflorescentiae affinis, sed foliis praecipue ovalibus, nervis manifestis, staminibus et antheris minoribus, angulo dehiscendae et forma antherarum differt. Etiam *S. impressifoliae* (Miers) A. C. Smith forma folii et structura inflorescentiae affinis, sed habitu, diametro floris et numero ovulorum in quoque loculo differt.

Shrub to small tree, 5–8 m, glabrous, branches terete, smooth, older fissured, punctiform lenticels sparse. Leaves opposite; stipules not seen, caducous, leaving interpetiolar ring; petioles (0.5–)1–1.5 cm, canaliculate, drying wrinkled and black; blades (16.2–)20.4–22.5(–27.5) × (6.7–)9.1–10.1(–13.6) cm, ovate to elliptic, the base rounded to cuneate, the apex acute, the margin entire and thickened, slightly revolute, chartaceous, drying dark brown on the adaxial side, light brown and minutely alveolate on the abaxial side, sometimes with darker or blackish costae and veins, venation brochidodromous, veins on both sides prominulous, secondary veins invisible or slightly immersed. Inflorescence fasciculate, with an indeterminate number of flowers, ramiflorous at leafless nodes, apparently flowering during successive seasons; bracts ca. 0.3 mm, triangular, the margin fimbriate; pedicels 3.3–5.4 mm, terete, pruinose. Flower buds spherical, open flowers reported as green (*Ducke 684*) or rose-yellow (*Fróes 22909*), 6.6–7.6 mm wide at anthesis; sepals 5, 0.8–1.4(–1.8) × 1–1.2(–2.3) mm, triangular or rhombic, unequal, ± carnose, the base pruinose, the margin minutely erose; petals 5, (2.6–)3.2–3.9

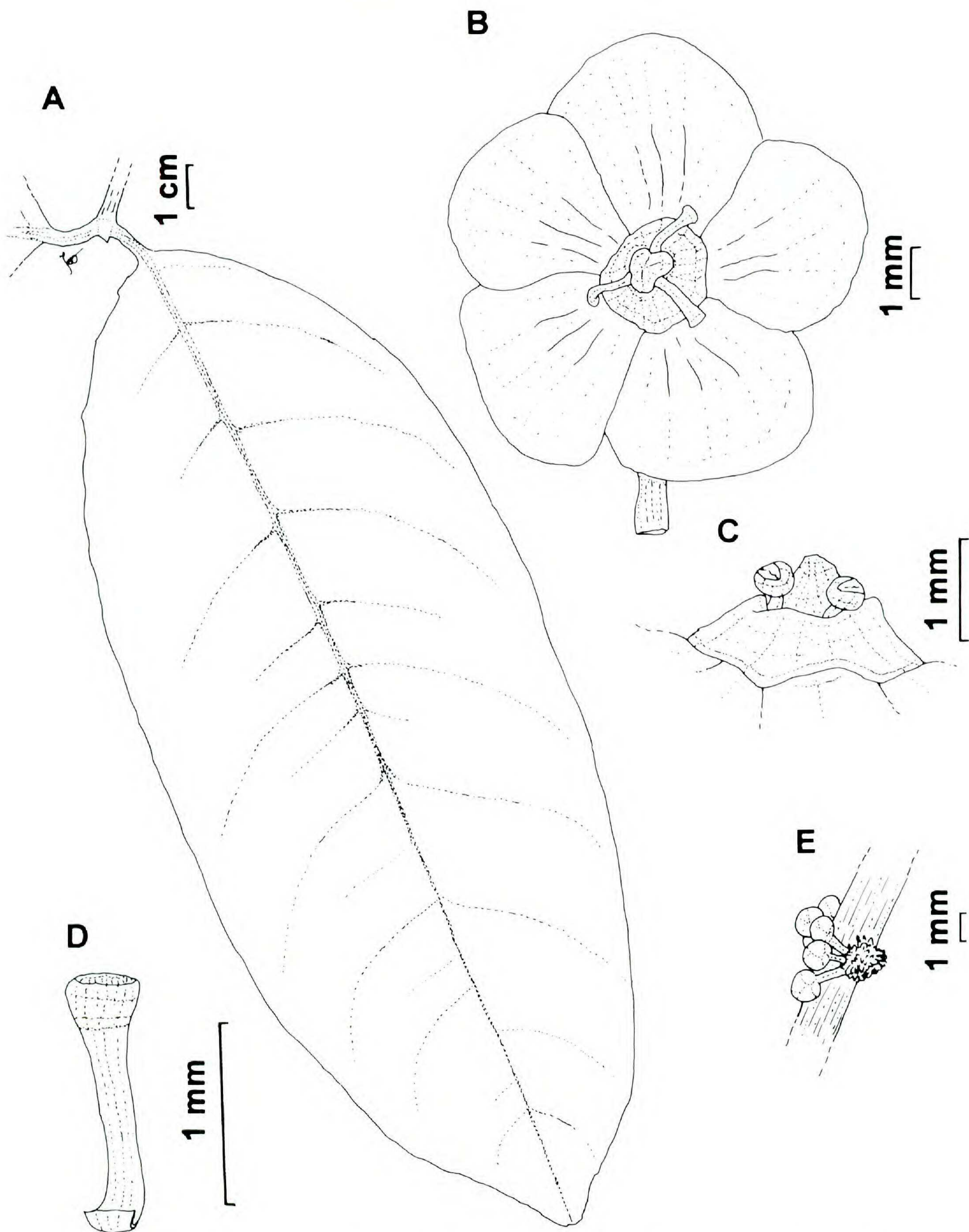


Figure 2. *Salacia negrensis* Lombardi. —A. Branch with leaf. —B. Apical view of flower. —C. Lateral view of disc, stamens, and pistil. —D. Abaxial view of stamen. —E. Detail of the fasciculate inflorescence. Drawings by the author: A, E from *Ducke 684* (NY); B–D from the holotype *Fróes 22909* (IAN).

× 3–3.8(–4.3) mm, widely elliptic, papery, spreading at anthesis, the base marked by divergent strips, the margin entire; disc annular-pulvinate, 0.42–0.9 mm high, 0.62–0.96 mm thick, carnose, free from reproductive parts, the outer margin not flattened,

rounded at edge; stamens 3, ca. 0.89 mm, spreading after anthesis, the filaments flattened, the anthers 0.19–0.22 × 0.27–0.43 mm, ellipsoidal, dorsifixed, bilocular, confluent thecae, dehiscence extrorse by apical slit at 180°; pistil pyramid-shaped, pruinose,

ovary 3-lobed, 3-locular, with 2 ovules in each locule, style smashed in examined specimens, central, triangular, stigmas obscure. Mature drupes ca. 3.9×4.5 cm, spheroid, the epicarp crustaceous, smooth, drying dark brown with pruinose irregular strips; seeds ca. $2.3 \times 1.3 \times 1$ cm, polygonal.

Phenology. Collected with flowers in January, March, and November; collected with immature fruits in January and mature fruits in April.

Distribution and habitat. *Salacia negrensis* occurs in seasonally flooded forests (mata de várzea) in the State of Amazonas along the Rio Negro and its affluent Rio Branco in the State of Roraima.

Conservation status. The most recent collection of this species is dated 28 Apr. 1974 (*J. M. Pires et al. s.n. [IPEAN 14383]*); new collections are unknown, and the conservation status of this species is Data Deficient (DD) by the IUCN categories. I have failed to define the precise location of the collection localities, all of them Rio Negro islands, except for Baía Boiassu (Boiaçú) [$01^{\circ}37'59''\text{S}$, $61^{\circ}25'54''\text{W}$], near the confluence of middle Rio Negro and Rio Branco.

Etymology. The specific epithet of this species is a reference to the Amazonian Rio Negro, along which most of the specimens were collected.

This new species resembles *Salacia elliptica* through its inflorescences, but differs from it through its predominantly ovate leaves with prominulous veins (vs. elliptic to rhombic leaves with veins immersed on both sides or slightly prominulous only on the abaxial side), smaller stamens (ca. 0.89 mm vs. 1.07–2.5 mm) and anther ($0.19\text{--}0.22 \times 0.27\text{--}0.43$ mm vs. $0.37\text{--}0.59 \times 0.53\text{--}0.84$), and anther dehiscence angle (180° vs. 130°) and shape (elliptic vs. reniform). *Salacia negrensis* also resembles *S. impressifolia*, chiefly through its leaf shape and inflorescence type, but is easily distinguished through its habit (shrub or tree vs. liana), flower diameter (6.6–7.6 mm vs. 10.8–21.1 mm), and ovule number per locule (2 vs. 6).

Paratypes. BRAZIL. **Amazonas:** baixo Rio Negro, ilhas da baía Boiassu [sic, Boiaçú], 24 Mar. 1941, *A. Ducke 684* (F, IAN, MG, NY, R, RB-2); Paran -ubim, Rio Negro, 31 Jan. 1959, *J. S. Rodrigues, J. M. Pires & N. T. Silva 8* (IAN); Rio Negro, Ilha da Independ ncia, 17 Apr. 1952, *R. L. Fr es 28287* (IAN). **Roraima:** perto da boca do Rio Ajarani com o Rio Branco, 28 Apr. 1974, *J. M. Pires, P. B. Cavalcante, H. Magnano & N. T. Silva s.n. [IPEAN 14383]* (IAN). Sine loc., Instituto Agron mico do Norte 11 (IAN).

3. *Salacia odorata* Lombardi, sp. nov. TYPE: Ecuador. Esmeraldas: Quinind  Cant n, Bilsa Biological Station, Reserva Ecol gica Mache-

Chindul, 35 km W of Quinind , $00^{\circ}21'\text{N}$, $79^{\circ}44'\text{W}$, 500 m, 18 Nov. 1996, *J. L. Clark, F. Gurumend  & H. Weinert 3434* (holotype, MO; isotype, QCNE not seen). Figure 3.

Haec species *Salaciae cordatae* (Miers) Mennega forma, textura et colore foliorum desiccatorum affinis, sed floribus fasciculatis et disco applanato absque denticulis apicem versus differt. Ab omnibus speciebus similibus generis floribus fasciculatis, pedicellis longis, petalis fortiter adhaerentibus in alabastro, cicatricibus quarum persistentibus post anthesin et disco applanato margine externo fimbriato abunde differt.

Tree, (4–)8–10(–20–25) m, DBH 12–20 cm, glabrous, branches terete, fissured (longitudinal lenticels?), frequently covered by epiphyllous bryophytes. Leaves opposite to subopposite; stipules 0.4–0.5 mm, triangular, margin fimbriate, early caducous, not leaving interpetiolar ring; petioles (0.6–)0.8–1.2(–2.3) cm, canaliculate, lenticellate, drying green; blades (11–)11.7–18.5(–24.2) \times (3.4–)4–7.3(–12.5) cm, elliptic, the base cuneate, rarely rounded, the apex acuminate, the margin entire and slightly thickened, chartaceous, drying green or sometimes brown, venation brochidodromous, veins on both sides prominulous, secondary veins invisible or slightly immersed, abaxial side minutely punctate and tuberculate. Inflorescence fasciculate, with indeterminate number of flowers, ramiflorous at leafless nodes or axillary, apparently flowering during successive seasons; bracts ca. 0.8 mm, triangular, the margin fimbriate; pedicels 20–24 mm, terete, sometimes minutely tuberculate. Flower buds fusiform, open flowers reported as green (*Clark et al. 3434*) or orange (*Clark 3968, Clark et al. 4082*), ca. 14 mm wide at anthesis; sepals 5(to 6), $1.3\text{--}1.6 \times 1.3\text{--}1.9$ mm, triangular, unequal, \pm carnose, the margin minutely denticulate; petals 5(to 6), $4.2\text{--}7.5 \times 2.4\text{--}3.3$ mm, elliptic, carnose, together firmly adherent in bud, after anthesis spreading and with distinct scar made by the overlapping petal, the margin entire; disc flat, 0.7 mm high, 1 mm wide, carnose, the inner margin raised in a thicker ring, the outer margin fimbriate, dark green; stamens 3(to 4), 1–2.4 mm, erect at anthesis, yellow-green, the filaments flattened, the anthers $0.4\text{--}1.1 \times 0.7\text{--}0.9$ mm, reniform, dorsifixed, unilocular, dehiscence extrorse by apical slit at ca. 160° ; pistil pyramid-shaped, ovary 3-lobed, 3-locular, with 2 ovules in each locule, style ca. 0.7 mm, central, triangulate, stigmas obscure, punctiform. Mature drupes ca. 3.5×3 cm, spheroid, orange, the epicarp crustaceous, smooth or rough, drying dark brown with pruinose spots; seeds not seen.

Phenology. Collected with flowers in November, February, and March, collected with immature fruits

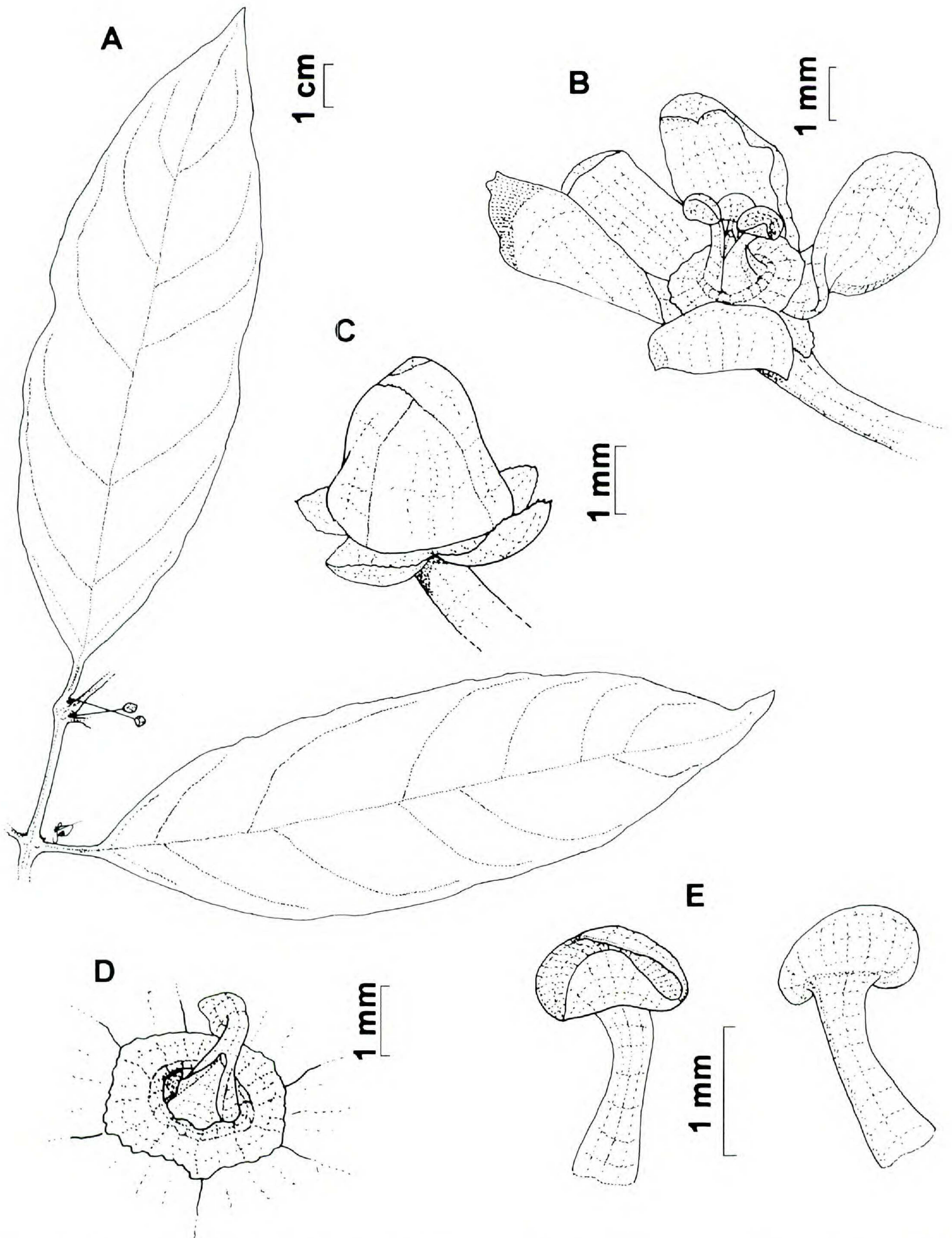


Figure 3. *Salacia odorata* Lombardi. —A. Branch with leaves and flowers. —B. Lateral view of flower. —C. Flower bud. —D. Apical view of an open flower showing disc, one stamen, and pistil. —E. Adaxial and abaxial views of stamens. Drawings by the author: A, C from *Cazalet & Pennington 5270* (US); B, D–E from *Clark et al. 4082* (BHCB).

in February and March, and with mature fruits in March.

Distribution and habitat. *Salacia odorata* occurs at altitudes of 305–650 m in seasonal rainforests and premontane wet forests of the Peruvian Department of Madre de Dios and of the Ecuadorian Provinces of Pichincha, Napo, and Esmeraldas.

Conservation status. The Bilsa Biological Station collection area in the Esmeraldas Province belongs to the Jatun Sacha Foundation, a private, nonprofit Ecuadorian NGO, and this species also occurs inside the Peruvian National Park of Manu, and the Ecuadorian Estación Científica Yasuní, which guarantees its preservation in the near future; however, the population status is unknown, and *Salacia odorata* is classified as Data Deficient (DD) by the IUCN Conservation Status categories.

Etymology. The specific epithet of this species is a reference to the wintergreen smell reported on the bark by the type collector. Wintergreen is the common name for *Gaultheria procumbens* L. and *Betula lenta* L., past and present sources, respectively, of medicinal methyl salicylate (Mabberley, 1987).

Salacia odorata resembles *S. cordata* through its shape, texture, and color of dried leaves but is distinguished from it through its inflorescence type (fasciculate vs. thyrsoid-paniculate) and very different flowers; in addition, the disc of *S. cordata* is tubular around the ovary and apically ends in three teeth. This species stands apart through its long pedicels, its petals that are strongly adherent in bud and marked after anthesis, and its flat disc with a thick ring on the inner border and the fimbriate outer border. These combined characteristics and the fasciculate inflorescence allow its easy recognition.

Paratypes. ECUADOR. **Esmeraldas:** Quinindé Cantón, Bilsa Biol. Stat., Reserva Ecol. Mache-Chindul, 40 km NW of Quinindé, Loma de los Guerrilleros, 19 Feb. 1997, *Clark 3968* (BHCB, MO); 35 km W of Quinindé, 20 Mar. 1998, *Clark & Pallis 4873* (MO); 35 km W of Quinindé, 5 km W of Santa Isabel, 6 Feb. 1996, *Clark, Kerber & Plihal 2034* (MO); 40 km NW of Quinindé, Loma de los Guerrilleros, 12 Mar. 1997, *Clark, Cousins, Nuñez & Richter 4035* (MO); 40 km NW of Quinindé, Loma de los Guerrilleros, 12 Mar. 1997, *Clark, Cousins, Nuñez & Richter 4082* (BHCB, MO); carr. Herrera–El Páramo (Santa Isabel), 18 Feb.–5 Mar. 1995, *Palácios, Clark & Jaramillo 13500* (MO); carr. vecinal Herrera–Los Monos, cabecera del Río Aguacatal, finca de Francisco Cantos, 24–26 Feb. 1995, *Palácios 13656* (MO).

Napo: Estación Científica Yasuní, Río Tiputini, NW de la confl. con Río Tivacuno, 22 Jan. 1998, *Romoleroux 3066* (F); Pichincha: 20 km W of Santo Domingo de los Colorados, 3 Nov. 1961, *Cazalet & Pennington 5270* (US), 1 Nov. 1961, *Cazalet & Pennington 5244* (US). PERU. **Madre de Dios:** Prov. Manu, Parque Nac. del Manu, Río Manu, s.d., *Nuñez 14585* (F).

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